Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7-4.2 GHz Band	)	GN Docket No. 18-122
	)	
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared between the Fixed Service and the Fixed Satellite Service	)	RM-11778

REPLY COMMENTS OF RAYTHEON COMPANY

Raytheon Company ("Raytheon"), by its attorney, hereby submits its reply to comments in response to the July 19, 2019, Public Notice[1] in the above-captioned proceeding.[2]

General Points

There is broad consensus in the comments filed in response to the Public Notice – and in the record in general – that incumbent licensed and registered earth station operations must be protected from harmful interference. There is also strong support, including from flexible use

[1] *Wireless Telecommunications Bureau, International Bureau, Office of Engineering and Technology, and Office of Economics and Analytics Seek Focused Additional Comments in 3.7-4.2 GHz Band Proceeding*, Public Notice, GN Docket No. 18-122, DA 19-678 (rel. July 19, 2019) ("Public Notice"). Unless otherwise noted herein, references to "Comments" of a party refer to comments filed by that party on August 7, 2019, in GN Docket No. 18-122.

[2] Raytheon's interest in this proceeding, as a supporter of more than 140 receive-only earth stations operating in the 3.7-4.2 GHz band that form an important component of the National Oceanographic and Atmospheric Administration's ("NOAA's") Satellite Broadcast Network ("SBN") and that feed the Advanced Weather Interactive Processing System ("AWIPS"), is set out in its July 3, 2019, comments in GN Docket No. 18-122.

proponents, for the principle that 5G operations and other new entrant services in any flexible use spectrum portions of the band must not interfere with C-Band earth stations.[3]

There are many details in conjunction with the foregoing principles that are far from being worked out, including what are sufficient protection criteria and mechanisms. In general, out-of-band-emissions limits ("OOBE limits") are used to protect adjacent band operations, but certain carrier commenters want to push the burden of protection largely or even wholly onto earth station operators. Some flexible use proponents suggest that satisfaction of 3GPP specifications for OOBE limits should be all that operators in the flexible portion of the band need to do, operationally, on their part to protect fixed satellite service ("FSS") operations that are moved to the upper part of the band.[4] Raytheon submits that this gesture is inadequate given that it is unlikely and, in any event, *not* clear that those OOBE limits were developed with, or can be seamlessly adapted to, the particular 3.7-4.2 GHz adjacent band (and co-channel, in the case of the AT&T proposal) sharing situations under consideration.[5]

Other commenters suggest that the solution would be to require earth stations that remain in the 3.7-4.2 GHz band after any transition to incorporate new receiver filters.[6] This raises the

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[3] Comments of CTIA at 8 (the Commission should "[a]dopt reasonable interference protection rules that will protect earth station operations"); Comments of Verizon at 1 ("Incumbent C-Band earth station operations must be protected, and 5G operations in the 3.7-4.2 GHz band must not interfere with those incumbent C-Band earth stations").

[4] *See* Comments of Verizon at 4.

[5] Raytheon agrees generally with the notion that a different set of requirements might apply to flexible use operations located sufficiently far away from earth station sites where there is effectively no chance that interference protection criteria designed to protect earth stations from harmful interference would be exceeded, but suggests that proponents of such frameworks need to provide more detail to round out their proposals, and interested parties should be able to respond after a proper analysis. *See, e.g.,* Comments of Verizon at 4 (arguing that mobile carriers should be "free from overly restrictive constraints in areas where they cannot impair incumbent earth stations").

[6] *See, e.g.,* Comments of C-Band Alliance ("CBA") at 8-9, 30. *See also* Comments of Verizon at 6 (urging adoption of "a receiver protection threshold measured at C-Band earth

question, in turn, as to what receiver protection thresholds those filters must meet, which is itself tied to the unanswered questions of what constitutes harmful interference and what is the appropriate interference protection criterion ("IPC"). Raytheon also notes that proponents of mandatory earth station filters have yet to explain the proposed details of that aspect of any transition – specifically how these will be installed in a manner to minimize, if not avoid, disruption to earth station operations. Naturally, the costs of any earth station filters and their installation should be borne by the new entrants, either directly or indirectly through the auction proceeds.

CTIA proposes that flexible use operations in the 3.7-4.2 GHz band must modify operations in the event an earth station experiences harmful interference.[7] Raytheon supports this in principle, but of course it is essential to first get the IPC right – in other words, what constitutes harmful interference – as noted above. That said, the National Association of Broadcasters ("NAB") rightly points out that there is currently no mechanism in the C-Band that would allow earth stations to immediately identify the source of interference and timely require that source to cease transmissions until the interference event can be resolved.[8] These procedural matters need to be addressed to enable CTIA's meritorious suggestion to be implemented and the matter of protection of earth station operations to be realized.[9]

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station locations that will provide protection where it is needed but otherwise enable flexibility for 5G operators," implying that any additional reduction in the receiver protection threshold to ensure reliable operation would require earth station install receiver filters).

[7] *See* Comments of CTIA at 10 (urging the Commission to "require 5G operators to modify their operations in the event that an earth station experiences harmful interference").

[8] Comments of NAB at 9-10. Verizon suggests a "unified call center with real-time links to the Network Operations Centers of all C-Band licensees" to receive and help resolve reports of interference. Comments of Verizon at 11-12.

[9] Raytheon takes no position on the matter of whether, as a number of commenters claim and others dispute, a satellite operator-led transition is the fastest and most streamlined approach to making some portion of the 3.7-4.2 GHz band available for flexible use.

Lockheed Martin Corporation points out, appropriately, that the Tracking, Telemetry & Command ("TT&C") earth stations supporting C-Band satellites must be protected *on existing frequencies* (at the low end and the upper end of the 3.7-4.2 GHz band).[10] Raytheon agrees. This proceeding, while focusing on a number of complex proposals for transition to allow the flexible use of the band, should not lose sight of this critical issue. As Lockheed Martin explains, these earth stations possess no frequency agility for those satellites already launched and they support *all* satellite operations in the band, regardless of the range of frequencies identified to accommodate other FSS earth stations.[11] Accordingly, whatever plan the Commission adopts for the 3.7-4.2 GHz band, protection of these earth stations is a must.

Consideration of Point-to-Multipoint Services in the Band Is Premature

Raytheon agrees with the several commenters concerned that trying to fit point-to-multipoint services ("P2MP") simultaneously in the same spectrum that exists in the final framework to accommodate existing FSS operations will only complicate the "repacking" of the earth stations and delay the transition.[12] There are already other significant issues of complexity, cost, and timing with the proposal of ACA Connects ("ACA") *et al.* (in terms of moving significant numbers of earth station operations to fiber facilities in a timely and cost-effective fashion) and also the AT&T proposal in terms of coordination within the guard band to allow it to be used for commercial flexible use. Raytheon submits that introducing P2MP into the mix at this time would needlessly complicate the task of ensuring that incumbent registered earth

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10 Comments of Lockheed Martin *generally*.

11 Lockheed Martin observes that these TT&C operations are critical not only for in-orbit satellites providing service to the United States in the 3.7-4.2 GHz band, but are also used during launch and early operations ("LEOP") activities to support both U.S. and non-U.S. satellites that are experiencing anomalies requiring emergency support. *See id.* at 5-6.

12 *See, e.g.*, Comments of CBA at 19-21; Comments of CTIA at 11-13; Comments of NAB at 9.

stations are successfully transitioned and protected from harmful interference under either of these proposals.[13] Accordingly, only after the FSS earth station transition is complete and adequate ongoing operational assurances are in place (such as the full-band, full-arc policy) in some form,[14] might P2MP entry be considered. Raytheon submits that possible P2MP entry should be deferred to a separate proceeding or a subsequent phase of GN Docket No. 18-122 would be required.[15]

Given that there are other bands that the Commission is in the process of making available for P2MP deployment (*e.g.*, the 3.5 GHz band) or is currently considering for expanded availability for P2MP operations (*e.g.*, the 6 GHz band), as CTIA and others note,[16] Raytheon suggests that the urgency for addressing the introduction of P2MP in any portion of the 3.7-4.2 GHz band is not present. Further, although there may be legitimate needs to allow for P2MP entry outside of a flexible use spectrum auction, several commenters also note that flexible use licenses awarded through auction, such as those contemplated for some lower portion of the 3.7-4.2 GHz band, could accommodate P2MP-like operations.[17]

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[13] Nonetheless, Raytheon continues to believe that a satisfactory demonstration might be possible that P2MP could be introduced at a future time while fully protecting earth station operations and retaining the full-band, full-arc policy in the portion of the band that remains available to the FSS. *See* Raytheon July 18, 2019, Reply Comments at 5-6.

[14] Raytheon sees the potential merit, as suggested in some comments, in tailoring the definition of "full-arc" in certain locations based on what portion of the orbital arc realistically might be available at those locations.

[15] Accordingly, for similar reasons, the Commission should defer any consideration of introducing P2MP in the FSS portion of the 3.7-4.2 GHz band as well as any discussion of an overlay auction in that portion of the band. *See* Comments of Verizon at 18-20.

[16] *See* Comments of CTIA at 11-12. *See also, e.g.*, Comments of AT&T at 13 (describing the amount of unlicensed and unlicensed spectrum already being considered to enable P2MP deployments); Comments of Satellite Industry Association ("SIA") at 2-4 (same).

[17] *See, e.g.*, Comments of AT&T at 12; Comments of CTIA at 11-12. Raytheon takes no position here on whether the Commission should refrain from adopting frameworks specifically for new P2MP entry.

Not only should further consideration of P2MP be deferred at this time for the reasons mentioned above, but it is worth underscoring that the record indicates that there are a number of faults with the Reed Study supplied by the Wireless Internet Service Providers Association ("WISPA") *et al*.[18] Most fundamentally, CTIA explains in detail that the Reed Study misappropriates the methodology and results used to study a much different scenario – what is necessary to close 5G links and provide mobile coverage – to apply to a very different situation that requires very different operating assumptions than initially examined – protection of FSS earth stations from P2MP links.[19]

Setting that fundamental question aside, the assumptions incorporated into the study fail to reflect real-world operating conditions of fixed P2MP deployments, as SIA notes, likely understating the interference threat in many situations.[20] Others similarly note that the study overstates the sufficiency of the proposed protection zones to protect earth stations.[21] But even with the rosy picture the Reed Study presents, the Content Companies point out that the Reed Study can only conclude that the mitigation measures (*e.g.*, protection zones) proposed will protect only "most" of the FSS earth stations. All registered FSS earth stations merit protection from harmful interference. For all of these reasons, any consideration of P2MP operations in the FSS spectrum should not be undertaken at the present time, whatever merit there *might* be to coexistence with incumbent receive-only earth stations, which should be protected.

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18 Prof. Jeffrey H. Reed, *et al*., *3.7 GHz FSS and Fixed Wireless Access Co-channel Coexistence Study*, Reed Engineering ("*Reed Study*"), filed as attachment to Letter from WISPA, Google LLC, and Microsoft Corp. to Marlene H. Dortch, Secretary, FCC (filed July 15, 2019).

19 *See* Comments of CTIA at 14.

20 *See, e.g.*, Comments of SIA at 6-7.

21 *See, e.g.*, Comments of CTIA at 14-15; Comments of CBA at 21 (failure to consider aggregate fixed station interference).

The Proposal of ACA *et al*. to Transfer FSS to Fiber Has Serious Flaws

In its July 18 Reply Comments in this proceeding, Raytheon expressed its general concerns with the proposal by ACA, Charter, and CCA to transition a large part of the C-Band earth station operations to fiber.[22] The record developed in response to the most recent Public Notice underscores those concerns. Globecast notes that fiber is, at most, a complement, not a replacement, to the C-Band for content distribution, and that it is already being used for that purpose today. But, Globecast warns, transition to and reliance upon fiber alone would be imprudent and invite potential degradation and unreliability of video content distribution.[23]

A number of commenters note that fiber transition would be much more difficult in many locations than ACA, Charter, and CCA suggest in their joint proposal.[24] The Content Companies note that the ACA proposal understates the complexity, cost, timing, and risk of any transition to fiber,[25] and AT&T calls for more study of the fiber transition proposal before it can be considered in light of the "weighty" legal, technical, and financial questions it presents.[26] Naturally, carriers such as AT&T are concerned about these matters as they wish to see an expeditious transition to enable entry by flexible use operators as soon as possible with minimal cost burden.

Raytheon has an additional concern with the proposal of ACA *et al.* If a framework is predicated on a presumed successful transition to fiber of all video content distribution earth

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22 July 18, 2019, Comments of Raytheon at 3-4.

23 *See* Comments of Globecast at 4-5. *Accord* Comments of NAB at 3-5; Comments of the Content Companies at 5-6. PSSI points out that occasional earth station use for video content distribution, such as at major sports or new events, could be undermined by a forced transition to fiber. Rather, even if a transition to fiber for video content distribution were otherwise achievable, C-Band earth station use must continue to be accommodated in any final framework. *See* Comments of PSSI at 3-6.

24 *See, e.g.*, Comments of NAB at 5-8; Comments of Alaska Telecom Association at 2-4.

25 *See* Comments of the Content Companies at 5-13.

26 *See* Comments of AT&T at 5, 10-12.

station operations, but there are significant issues as predicted by a number of commenters and stakeholders, any late-found need to accommodate more earth stations than expected in the remaining spectrum for FSS (even on a temporary basis in some locations as delayed fiber deployment is completed) could jeopardize the transition and continued operation of those earth stations, such as those that Raytheon supports for NOAA and other agency customers that were never to be transitioned to fiber in the first place. In short, the prospect of a potential after-the-fact effort to accommodate content distribution earth stations because the problems of transition were not sufficiently studied and understood before a framework was adopted would put unexpected stresses on the spectrum identified to accommodate non-content earth station operators, contrary to the public interest.

Conclusion

Any framework the Commission adopts must protect incumbent registered earth stations, give them the flexibility needed through a full-band, full-arc policy to ensure continuity of operations going forward, and provide for reimbursement of all reasonable earth station operator transition costs under the framework adopted, including installation of receiver filters if mandated. The Commission should take care to avoid needlessly complicating the transition

under whatever frameworks it adopts by adopting rules to allow P2MP operations entry before any FSS transition is completed.

Respectfully submitted,

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